

AAAI-97 Highlights Developments in the AI Field

Sara Hedberg

It “is a privilege to do AI research at the end of the twentieth century,” began Benjamin Kuipers, program cochair, during his opening remarks at the Fourteenth National Conference on AI (AAAI-97) in Providence, Rhode Island, this summer. “A computer beat the world champion at chess. A robot is on Mars making a few of its own decisions.” Kuipers reminded us that these accomplishments are the result of 40 years of research; AI is much older than the technical sessions at this year’s conference.

This year’s conference not only celebrated AI’s visible achievements, noted Kuipers. At its heart, it is a technical conference. It centers on the science and technology that grow into applications.

Attendees at this year’s conference were privileged to witness the awarding of the Fredkin Prize to the IBM Deep Blue team that defeated world chess champion Garry Kasparov (see discussion to follow) as well as the Allen Newell Research Excellence Medal to the handful of AI research pioneers whose work led to Deep Blue’s victory.

Attendees also witnessed the first-ever reception with mobile robots serving hors d’oeuvres to the guests. They saw a robotic wheelchair that was steered by the eye movements of the rider. They watched computer games such as Scrabble and Go played by world-class human players in the first Hall of Champions.

However, the conference was more than the formal achievements and exhibitions. It was once again the place where the leading researchers in the field gathered to share research direc-

tions and progress in the field. The strong tutorial sessions, workshops, invited talks, the Innovative Applications of AI (IAAI) program, as well as 72 technical sessions, demonstrated the diverse activity going on under the AI umbrella. From intelligent agents to natural language, machine learning to reasoning and representation, the number of technologies that are maturing is impressive.

AI Growing Up

The hall was packed for the keynote address, “AI Growing Up,” by James F. Allen of the University of Rochester. Allen deftly compared AI to the stages of human development. First, he reminded the audience that AI is a very young area—only 40 years old. In his admittedly idealized model, during human infancy-childhood, the emphasis is on developing basic skills through creative exploration. During adolescence, we develop a sense of self-reliance, self-discipline, and habits for a lifetime. As adults, we refine and further develop ourselves, train future generations, and attain a deep understanding of life.

Allen asserted that AI has been in its childhood. The field now needs a better sense of self and self-control. AI is at a transition point, at a defining moment, according to Allen. There are working prototypes to support the experiments, such as game playing, expert systems, robots on Mars, and conversational agents.

The body of Allen’s talk focused on defining AI, its goals and methodological issues. He talked about the slippery slope of defining intelligence from various disciplines such as education and linguistics. He emphasized

that the working artifacts that have been constructed are a milestone and transition point in the field. He cited as evidence a broad range of systems, including a game-playing system that beat a world champion; heuristic scheduling systems that are faster than traditional approaches; decision-making expert systems in corporations, financial forecasting, robots, and vision systems; speech-recognition systems; and conversational agents.

This historical, developmental approach to AI was visible throughout the conference. During the overview presented at the 1997 Mobile Robot Competition, for example, time was spent looking back over the first five competitions and the progress that has been made in robot technology in such a few short years. Each year, the contestants at the annual Mobile Robot Competition get better, and the events get harder. This year, the events were the most lifelike to date: Robots from the leading research laboratories competed in events to find a television remote control, vacuum a home, pass hors d’oeuvres at the conference reception, and simulate finding life on Mars. More than 20 teams competed this year.

On the Shoulders of Giants

This theme of AI growing up was most dramatically driven home during the award ceremony for the Deep Blue team and the chess pioneers who paved the way. Following the award ceremony, there was a series of presentations that traced the progress of AI chess research. As Fredkin himself noted, a tremendous number of people across the world pushed the technology. It was clear that the Deep Blue team stood on the shoulders of giants such as John McCarthy, Ken Thompson, and Hans Berliner.

The AI community lauded Deep Blue’s achievement of a long-standing AI grand challenge—to be the first computer chess machine to beat the world chess champion. However, the celebration went far beyond verbal accolades with the Fredkin Prize. In 1980, Massachusetts Institute of Technology Professor of Computer Science Edward Fredkin established a three-tier prize to stimulate research in computer chess. The following year, the

first \$5,000 in prize money was given to two scientists from Bell Laboratories who built the first chess machine to achieve master status.

Seven years later, in 1988, the second tier of the challenge was reached by a team of five graduate students from Carnegie Mellon University (CMU) who built the first machine to achieve international master status. The machine was called Deep Thought, the ancestor of Deep Blue. Soon thereafter, the team moved to IBM and has since been working under wraps on Deep Blue.

Deep Blue stepped up to the third tier of the Fredkin Prize: The team was awarded the \$100,000 purse by Fredkin at AAAI-97 amid a highly enthusiastic full house. Team members were also awarded the Allen Newell Research Excellence Medal, sponsored by CMU. Each of the major researchers who helped blaze the trail for Deep Blue was also presented with Allen Newell Medals: Richard Greenblatt for MACHACK VI; David J. Slate and Lawrence R. Atkin for CHESS 4.7; Ken Thompson and Joe Condon for BELLE; Hans Berliner, Carl Ebeling, Gordon Goetsch, and Murray Campbell for HITECH; and Feng H. Hsu, Murray Campbell, Thomas Anantharaman, Andreas Nowatzyk, and Mike Browne for Deep Thought.

AAAI-97 indeed brought together, as Kuipers put it, many of the bricks in the wall of achievements that AI is building. If, as Allen asserted, the field is at the point of a major transition, if it is indeed entering the defining period of adolescence, then indeed there is much to look forward to at AAAI-98, AAAI-99, and beyond.

Conference proceedings and tapes of many of the sessions are available from the American Association for Artificial Intelligence (AAAI).

1997 IAAI Winners

The IAAI award is given to deployed applications that use AI and are recognized for their innovative use of technology and significant payback. Details of each application, including the business problem it addresses, the architecture, technology innovations, development effort, payback, and



The AAAI-97 Conference Reception was Held in the Exhibit Hall.

maintenance plans, are given in the conference proceedings, available from AAAI.

This year 11 applications received the award:

Computer diagnosis: Hewlett-Packard and IBM were the two winners in this category.

The Hewlett-Packard entry was PIM-TOOL, an expert system to troubleshoot computer hardware failures. It diagnoses the cause of failure of a Hewlett-Packard server.

The IBM entry was for the design of a high-performance help-desk application and its implementation result. The remote expert system to optimize repair efficiency (restore) is deployed at IBM in Rochester, Minnesota, to support the as/400 business computer systems. It builds on a previous rule-based application, allowing quick and easy maintenance and changes to the system.

Scheduling: Sistemas Cognitivos (Lisbon, Portugal), Union Pacific Railroad-Brightware, and Information Technology Institute (Singapore) were the three winners in this category.

The Sistemas Cognitivos entry was CREWS_NS (scheduling train crew in the Netherlands). It schedules the 5000 drivers and guards of the Dutch railways. It is a "white box" system for the planner who can see what is going on; can interact with the scheduler, proposing alternatives and querying

decisions; and can adapt the behavior of the system to ever-changing circumstances. The system allows automatic, semiautomatic, or manual scheduling modes.

The Union Pacific Railroad-Brightware entry was for the scheduling of rail at Union Pacific Railroad. It plans and schedules the production, packaging, delivery, and pickup of rail for the maintenance of 31,000 miles of railroad track in 24 states. It produces low-cost schedules that allocate resources.

The Information Technology Institute entry was SUNRAY V, an intelligent container trucking operations management and control system. It assists a human planner in the complex scheduling of container trucks within the constraints of the shipping agents, customers, and the port. Deployed at one of the larger haulage companies, with a vehicle fleet of 30 towheads and 220 trailers, it handles about 500 jobs a day.

Planning-Layout: Hyundai-Korea Advanced Institute of Science and Technology (KAIST) and La Caisse d'...pargne-Isoft (France) were the two winners in this category.

The Hyundai-KAIST entry was a case- and constraint-based apartment construction project planning system: FASTRAK-apt builds plans for new projects based on previous cases.

The La Caisse d'...pargne-Isoft entry was STHANA, a profitability forecast



AAAI Past President Raj Reddy and Professor Ed Fredkin Pose with Fredkin Prize and Allen Newell Research Excellence Medal Recipients.

and situation analysis system for automated teller machines (ATMs). *STHANA* helps one of the major French banks, La Caisse d'Épargne, manage 2500 ATMs all over France where the credit card system makes it highly profitable for banks to have high use of ATMs. It extracts information from existing data (economic, geographic, and internal bank data) from the bank's experts, builds up classifications on high-level descriptors from raw data, and eventually indicates a measure of the ATM's activity and profitability. The system highlights factors that could lead to higher profitability or pinpoints the ATM's vulnerabilities.

Regulatory compliance—Eligibility determination: Air Products and Chemicals, the New York State Department of Education—Siena College, Fannie Mae—Brightware, and Oxford Health Plans were the four winners in this category.

The Air Products and Chemicals entry was *CHEMREG*, using case-based reasoning to support health and safety

compliance in the chemical industry. This knowledge-based system supports compliance with regulatory requirements for communicating health and safety information in the shipping and handling of chemical products. The case-based reasoner automatically generates estimates of hazard-related properties for every product.

The New York State Department of Education Office of Vocational and Educational Services for Individuals with Disabilities—Siena College entry was *DISXPRT*, a Social Security disability screening expert system. It is an expert system tool for referral of social security disability recipients to vocational rehabilitation services. It enables paraprofessionals working as social caseworkers to assess and refer clients to rehabilitation services.

The Fannie Mae—Brightware entry was the *DESKTOP UNDERWRITER*, Fannie Mae's automated mortgage-underwriting expert system. Fannie Mae, the largest U.S. source of conventional mortgage funds, uses the system to im-

prove the efficiency of processing a loan by reducing the time, paperwork, and associated cost with loan origination. It processes loan applications with incomplete, unverified, and conflicting information. The system generates a credit recommendation based on the loan's conformity to credit standards and an eligibility recommendation based on the loan's conformity to eligibility requirements. The system helps standardize the interpretation of underwriting guidelines.

The Oxford Health Plans entry was the *PROVIDER SELECTION TOOL (PST)*. It assists members of this managed health care plan in selecting a primary care physician. Deployed as a help desk within Oxford and on the World Wide Web, it elicits search criteria from a member to assess and evaluate a roster of doctors that meet these criteria. A case-based system, it is currently used approximately 700 times a day; 96 percent of those who use *PST* have their needs met and have not called back with the same request.